Strategies for Success

Wetlands Training Workshop for Consultants

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Please Note: This presentation is for a training workshop only and is not meant to be a substitute for the Freshwater Wetlands Act or the *Rules and Regulations Governing the Administration and Enforcement of the Freshwater Wetlands Act*.

Extended Detention System Submittals

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Introduction

- Pertinent design considerations and standards
- Common deficiencies found in submittals

Introductory Information

- Probably the most common type of stormwater BMP submitted to the RI FWW Program.
- Provides mitigation of peak runoff discharge rates and water quality (primarily by removal of total suspended solids (TSS)). Relies on settling during and shortly after the storm event (36 hour drain down time).
- Typically designed to mitigate peak runoff discharge rates for 2, 10, 25, and 100-year 24-hour Type III rainfall events.

Introductory Information (Continued)

- Primarily see Surface Basins, although some Underground Systems are being submitted.
- Most surface basins feature a berm and an outlet structure.
- Most underground basins have an array of pipes or storage units, along with an outlet structure.

Design and Siting Considerations

- Typically for relatively small contributing drainage areas, (less than 10 acres).
- Avoid wetlands, stream channels, springs.
- RISDISM suggests 25’ separation to property line.
- Need to stay 50’ from an ISDS.
- Get authorization for siting in utility ROW’s.

Pertinent Standards

- RISDISM refers designer to the RISESCH (RI Soil Erosion and Sediment Control Handbook).
  - Berm construction parameters: side slopes, top width, settlement, compaction, cover type (loam & turf, riprap (if have acceptable need & rationale))
  - Provide adequate freeboard.
  - Provide for emergency overflow spillway. Design for 100year flow; can exclude flows in outlets >10” diam.

Pertinent Standards (Continued)

- Provide foundation cutoff for embankment basin
- Provide antiseep collars on outlet pipes through berms
- Provide trash racks on outlet orifices & weirs.

Pertinent Standards (Continued)

- Determine WQV as one inch times the impervious area within the contributing drainage area. Use total impervious area, including rooftops and paved areas.

- Determine the elevation that is attained by the WQV within the basin or storage system. Do not have any other outlets below this elevation, except for the WQV drain-out orifice.

Pertinent Standards (Continued)

- From WQV elevation and the elevation of the WQV release orifice, get the average head on the orifice as (elev1+elev2)/2.
- Size the extended detention orifice using the formula:
  A=Q /Cd (2gh)^0.5
- Q=avg discharge rate=WQV/129,600 sec (or 36 h)

Pertinent Standards (Continued)

- Design for Sediment Volume
  - Include sufficient volume in basin/system for accumulated sediments.
  - Helps to establish an appropriate maintenance schedule for sediment removal.
  - Consider use of a sediment forebay.

Pertinent Standards (Continued)

- Design for Sediment Volume (continued)
  - Formula:

    SV= (76.6 x RA x TE) + ((4 or 15.3)* x DA x TE) x T
  - Variables:
    - SV= Sediment Volume (cubic feet)
    - RA= Roadway Area and parking/driveway area (acres)
    - TE= Trap Efficiency (use 80%)
    - DA= Contributing Drainage Area (acres)
    - T= Time (years)
    - *: Use 4 for low density development, use 15.3 for high.

Pertinent Standards (Continued)

- The basin needs to have a minimum 3:1 length to width ratio from inlet to outlet.
  - Multiple inlets need to adhere to this standard.
  - Use baffles or berms as needed to achieve this.
  - Underground system need to adhere to this standard. Provide inlet and outlet at opposite ends of a long system.
  - Be sure to adequately depict & label basin contours (bottom of basin, top of berm, 1’ or 2’ contours intervals in between).

Pertinent Standards (Continued)

- Provide at least a 12” separation to the SHGWT (seasonal high groundwater table).
  - Provide site specific soils test data.
  - Alternatively use subdrains around the perimeter of the basin to lower the SHGWT, or
  - Use an impermeable liner (with or without subdrains) top separate the system from the SHGWT.
- Use 6” organic soil at bottoms of basins.

Pertinent Standards (Continued)

- Outlets:
  - Provide a filtered outlet device that precedes the WQV release orifice. This is typically a perforated pipe jacketed in filter fabric and embedded in crushed stone. The orifice needs to be situated such that it can be easily accessible for maintenance. A similar design needs to be included in an underground extended detention system.

Pertinent Standards (Continued)

- Outlets (continued):
  - Provide details of outlet structure, including crests of weirs inverts and inverts of orifices, and respective dimensions.
  - Include sufficient structural information for the outlet structure.

Pertinent Standards (Continued)

- Provide a 6” layer of organic soils at bottom of basin.
- Use 3:1 side slopes maximum. If steeper, RISDISM standards mention to properly document the constraints and address stability and safety issues.
- Use adequate E & S controls
- Use a low flow channel.
- Consider a sediment forebay.

Pertinent Standards (Continued)

- Provide inflow scour protection.
- Grade basin floor between 1% and 5%.
- Provide a maintenance access right of way. (RISDISM mentions 15’ width.) This may not cross the emergency spillway.
- Provide access ports for underground systems

Maintenance Considerations

- Include a long term Inspection & Maintenance Program on the plans.
- Include the name of the party to be responsible to ensure that this maintenance program is carried out.
- Periodic removal of sediments from basin/underground system. For surface basins the maximum interval is 10-year. More frequent removal is advisable. However, typically should not an assumption of more often than once every 2 years.

Maintenance Considerations
(Continued)

- Maintenance of outlet orifices and weirs, including the WQV release orifice, and trash racks.
- Annual mowing of grass bottom and side slopes
- Correction of any erosion

Some Common Deficiencies

- Failure to include roof runoff in the WQV calculation.
- Missing or inadequate maintenance program.
- Lack of 3:1 ratio on flow path through basin.
- Improper sizing of WQV release orifice.
- Including a primary release orifice below the level of the WQV.
- Failure to account analyze and design for SV.
- Berm and or topographic detail inadequacies.

Some Common Deficiencies

(Continued)

- Inadequate separation to SHGWT and/or inadequate site specific soil test data.
- Inadequate details of basin berm.
- No trash racks
- No antiseep collars used.
- Inadequate emergency spillway. (Advise using curb to prevent unaccounted-for underflow below spillway crest level.
- Inadequate E &S controls.